APPENDIX E
SOCIOECONOMICS

ENVIRONMENTAL IMPACT STATEMENT FOR THE DESIGNATION OF DREDGED MATERIAL DISPOSAL SITES IN CENTRAL AND WESTERN LONG ISLAND SOUND, CONNECTICUT AND NEW YORK

EPA
New England Region

US Army Corps
Of Engineers®
New England District

APPENDIX E-1

Economic Significance of Navigation-Dependent Facilities

Prepared for

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October, 2001

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LONG ISLAND SOUND
DREDGED MATERIAL DISPOSAL EIS

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1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Environmental Protection Agency, Regions I and II (EPA), and the U.S. Army Corps of Engineers, New England District (the Corps), are proceeding with the preparation of an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA). The EIS will consider the potential designation of one or more dredged material disposal sites in the waters of Long Island Sound (LIS) consistent with the provisions of Section 102(c) of the Marine Protection, Research, and Sanctuaries Act (MPRSA) and 40 CFR 230.80 of EPA's regulations under section 404 of the Clean Water Act (CWA). Prior to making a decision on designation, the EPA is required to evaluate the environmental and socioeconomic impacts of a range of alternatives for disposal of dredged material in the waters of LIS. In conducting this evaluation, potential economic impacts on businesses who depend on dredging must be considered in relation to the general and specific site selection criteria of the MPRSA.

Included in the economic impact analysis are several major tasks:

a) Survey of Navigation-Dependent Facilities

b) Determination of Dredging Needs and Future Quantities

c) Estimate Economic Significance of Navigation-Dependent Industries

d) Analysis of Social and Economic Impact of Disposal Alternatives

e) Analysis of Socioeconomic Impacts of Disposal Activities at Alternative Disposal Sites

This report covers the third item in the list above: c) Estimate significance on the region's economy of navigation-dependent facilities located within LIS study area. Tasks a and b are covered in a report: "Dredging Needs, Navigation-Dependent Facilities" (ENSR, October 2001). The results of tasks a, b and c will assist in the completion of tasks d and e.

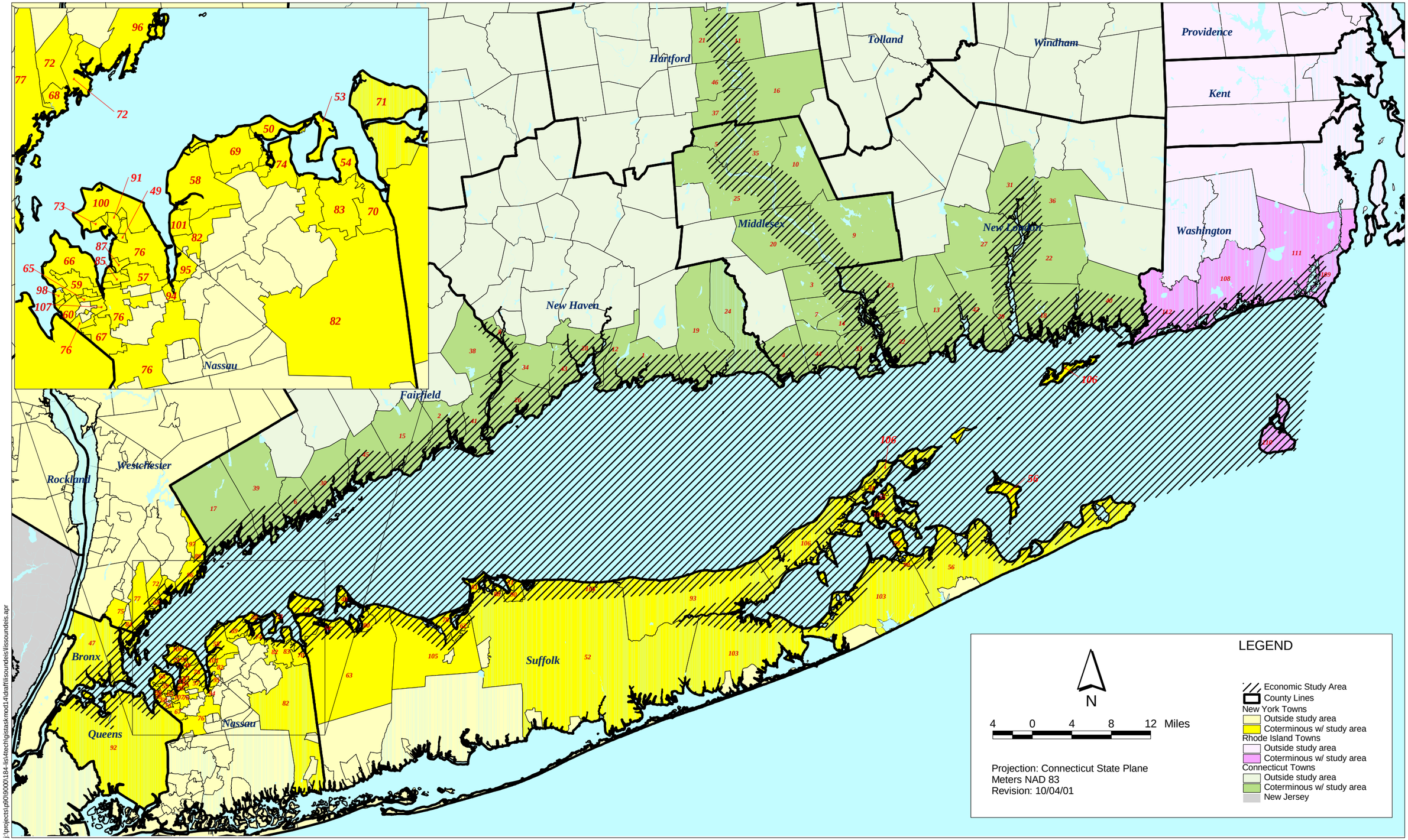
2.0 METHODS

2.1 STUDY AREA

For the purposes of identifying navigation-dependent facilities and assessing their effect on the region's economy, the study area was defined as follows. The study area extends from Montauk Point, New York west along northern Long Island to the East River, and then east through Connecticut to the southern coast of Rhode Island to Point Judith, then south to include Block Island, Rhode Island. The study area includes all harbors on Long Island Sound proper in Connecticut and New York. In New York, the study area includes the East River and Long Island shorelines of the Bronx and Queens counties, and the Long Island shoreline of Westchester, Nassau, and Suffolk Counties. In Connecticut, the study area includes the entire coastline. In addition, the study area includes the Peconic Bay and Gardiners Bay shorelines in New York, the Fishers Island Sound shores of Connecticut and Rhode Island, and the Block Island Sound shores of New York and Block Island. The study area does not include New York Harbor itself, but does include the Corps of Engineers, New York District projects for the eastern East River, Flushing Bay, Bronx River, and so forth. The Connecticut River below Hartford navigation project is included, as is the Thames River to Norwich and Housatonic River to Derby. All harbors and port or navigation-dependent facilities in this area, whether Federal or not, are included in the study area. The study area is shown on Figure 1.

2.2 DATABASE

As part of the EIS, a list of navigation-dependent facilities was assembled and a questionnaire was issued. The purpose of the questionnaire was to gather data to be used both in the assessment of dredging volume and in the estimation of navigation-dependent industry employment. While the response to the survey was sufficient for the assessment of dredging needs, it was not a reliable source of data for economic analysis for two primary reasons. First, while response to the survey was exceptionally strong by any standard, it was well short of what was needed to build a complete employment picture. Secondly, several if not many, respondents completed the employment field with the total number of their employees, not just the ones engaged in navigation-dependent operations. Given the difficulties with the data, it was not clear that the survey responses were any more accurate than data collected from government published sources; indeed, it was likely that the survey responses to the employment question were less accurate than other data sources. Given that economic impact models are employment driven, it was necessary to rely on these other data sources.



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Long Island Sound Dredged Material Disposal EIS
Figure 1: Navigation Dependent Facilities - Study Area

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2.3 DATA SOURCES

Bureau of Labor Statistics - The U.S. Department of Labor, Bureau of Labor Statistics (BLS), compiles data on employment and wages at varying levels of detail for different levels of geography. At the national level, data for virtually all non-farm, 4-digit SIC code industries are compiled and released on a monthly basis. At the state level, industry coverage varies by state with selected 2-digit, 3-digit, and 4-digit SIC code industries included for different states. At the county level, data is consistently available for 1-digit SIC code industries for virtually all counties in the nation.

Bureau of Economic Analysis - The U.S. Department of Commerce, Bureau of Economic Analysis (BEA), compiles data on industry output for many SIC code industries for the nation and most 2-digit and all 1-digit SIC code industries for all states.

County Business Patterns - The U.S. Department of Commerce, Bureau of the Census, compiles the County Business Patterns (CBP) database. It includes employment, locations, and payroll for most non-farm, non-government, 4-digit SIC code industries for all counties in the nation.

Economic Census - The U.S. Department of Commerce, Bureau of the Census, compiles data on sales, employment, locations, payroll, and other expenses for most 4-digit SIC code industries for all counties and some ZIP codes in the nation.

2.4 NAVIGATION-DEPENDENT INDUSTRY DEFINITION

All economic models utilized to estimate economic impacts by industry are based on Standard Industrial Classification (SIC) codes. For the purposes of this study, the following SIC codes were considered to be navigation-dependent industries:

Industry	SIC
Commercial Fishing – Finfish	0912
Commercial Fishing – Shellfish	0913
Ship Building and Repairing	3731
Boat Building and Repairing	3732
Deep Sea Foreign Transportation of Freight	4412
Deep Sea Domestic Transportation of Freight	4424
Water Transportation of Freight, NEC*	4449
Deep Sea Transportation of Passengers	4481
Ferries	4482
Water Transportation of Passengers, NEC*	4489
Marine Cargo Handling	4491
Towing and Tugboat Services	4492
Marinas	4493
Water Transportation Services, NEC*	4499
*NEC = Not Elsewhere Classified	

2.5 METHODOLOGY

The methodology employed by this study estimates the impact of navigation-dependent industries on the region's economy by simulating their absence, which is the standard approach used to assess the impact of an ongoing economic activity. The economic contribution of any industry to an area is more than just the employment and output directly associated with that industry. The total impact must be measured as the direct impact as well as the indirect and induced impacts, also referred to cumulatively as the multiplier impact.

The indirect impact is frequently referred to as the supplier impact, for that is precisely what it is. Every industry requires inputs from other industries to varying degrees. Typically, manufacturing industries, such as shipbuilding, have relatively high indirect impacts. These industries accept large quantities of raw and/or unfinished materials, such as steel or instruments and electronic components, in the production of their finished product. Service industries such as a marina, on the other hand, tend to be labor intensive and therefore have smaller supplier impacts.

The induced impact can be thought of as multiple rounds of supplier impacts, that is, the impact on each supplier through the entire supply chain. As a simple example, if boat building did not exist, then some amount of diesel engines would no longer be needed for boats. The manufacturer of such engines would then require less fabricated metal parts from his supplier of such products. That supplier would in turn require less primary metal from his supplier. As one would expect, the induced impact gets smaller as it works its way through the supply chain until it eventually dissipates altogether.

The standard method of estimating these impacts is to use an input-output model. This model estimates the amount of output that each industry demands from every other industry in its production process. The indirect impact on any industry can be estimated by examining the demand flows by that industry from every other industry in the matrix results.

The input-output accounts provide a comprehensive set of data that records the deliveries of industrial outputs among industries and final users, as well as the purchases of inputs from industries and suppliers of primary factors. These accounts are typically organized in a matrix format where each industry is recorded twice: as a row indicating the distribution of its output and as a column indicating the purchases of inputs to its production process.

The first round multiplier impact for any industry can be thought of as the column of the matrix representing its purchases from every other industry, excluding itself. In typical multiplier analysis, the impact of an industry on itself is also considered. However, in this study, the assumption is that the maritime-dependent industries being examined will disappear entirely in the absence of dredging. Accordingly, the impact of these industries on themselves is not considered to avoid double counting.

To estimate the second round of impacts, the first round results for each industry are fed back into the matrix, to account for the purchases that each of these industries makes. The process is repeated until the initial impact dissipates. For the purposes of this study, fifteen iterations were performed on the input-output matrix, although not all industries had significant impacts after the first few rounds.

The input-output analysis is similar to that used in the commonly used RIMS model. However, the RIMS model aggregates its SIC codes in many instances, resulting in less detail. Conceptually, the RIMS model has fewer 'columns' of input detail than that used by the DRI-WEFA model. Since the maritime-dependent industries are best analyzed at the four digit SIC level of detail, the DRI-WEFA model offers a more accurate representation of the impact of these industries. For a more complete description of DRI-WEFA's input-output model, refer to Appendix B.

Given the changes in output yielded by the input-output model, changes in employment within each industry were constructed from estimates of output per employee for that industry. These changes in employment were fed into DRI-WEFA's regional model. This model is used by DRI-WEFA for simulating changes in state economies as well as in regular forecast production. Employment is a primary driver in virtually all macroeconomic models, and the change in employment yields the impacts on income, taxes and Gross State Product. DRI-WEFA's regional model is described in more detail in Appendix A.

3.0 RESULTS

The total impact of navigation-dependent industries in the study area is outlined in Table 1. Collectively, these industries across the three states in the study area account for in excess of 52,000 jobs through their direct, indirect and induced impacts. These workers produce nearly six billion dollars of gross state product (GSP) and earn nearly seven billion dollars in personal income. In the absence of navigation-dependent industries, government coffers would be more than $850 million lighter. The impact on taxes includes state and local government receipts from income and sales taxes.

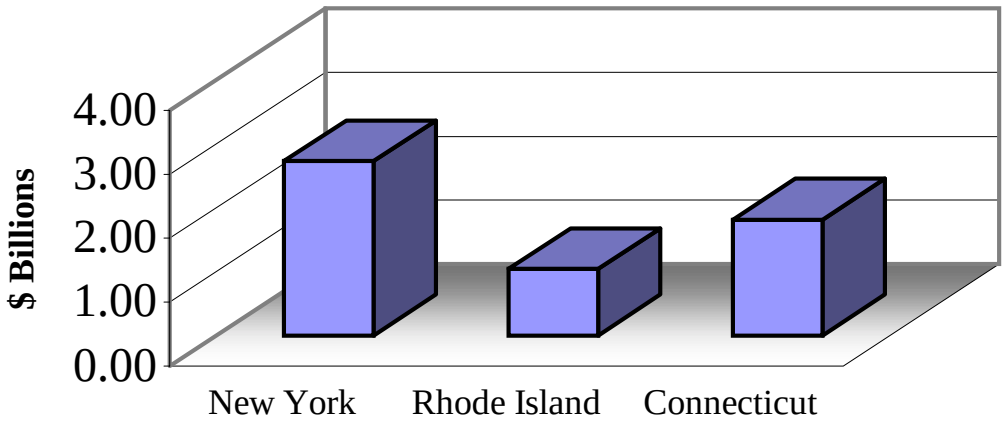
These results are shown in Table 1.

TABLE 1 ECONOMIC BENEFITS GENERATED BY NAVIGATION-DEPENDENT INDUSTRIES IN THE LIS STUDY AREA

State	2001 Employment	2001 GSP ($ Millions)	2001 Income ($ Millions)	2001 Taxes ($ Millions)
New York	23,857	2,726.3	4,341.1	600.7
Rhode Island	11,511	1,042.5	579.6	66.2
Connecticut	17,481	1,812.8	1,553.4	185.4
TOTAL	**52,849**	**5,587.6**	**6,474.1**	**852.3**

The impact on the study area's GSP is shown graphically by state in Figure 2.

FIGURE 2 CONTRIBUTION OF NAVIGATION-DEPENDENT INDUSTRIES TO GROSS STATE PRODUCT BY STATE



The degree to which navigation-dependent industries affect their state's economic fortunes depends to some degree on the state's industrial mix. Table 2 indicates the distribution of the economic impact across industries in the study area.

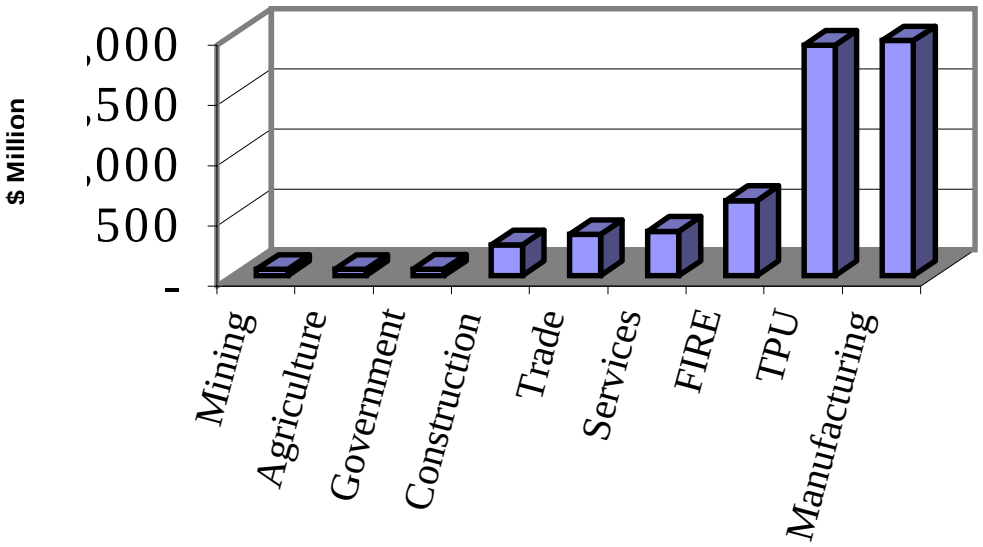
TABLE 2 DISTRIBUTION OF THE ECONOMIC IMPACT ACROSS INDUSTRIES IN THE STUDY AREA

Industry (SIC Order)	Impact of Navigation-Dependent Industries on GSP for the Study Area (Millions $)	Share of the Industry Impact (%)
Agriculture	49.8	0.9
Mining	49.2	1.4
Construction	252.3	4.5
Manufacturing	1,945.4	34.9
TPU*	1,909.3	34.2
Trade	338.2	6.1
FIRE**	618.9	11.1
Services	365.3	6.5
Government	53.1	1.0
TOTAL	**5,581.6**	**100.0**

*Transportation & Public Utilities
** Finance, Insurance & Real Estate.

The GSP impact of navigation-dependent industries in the study area is shown graphically in Figure 3.

FIGURE 3 GSP IMPACT FOR STUDY AREA



As one would expect, the transportation and public utility sector (TPU) sees a proportionately large impact from navigation-dependent industries. Manufacturing experiences the largest impact due to the direct impact on industries such as shipbuilding, but also due to the reliance by manufacturing on water transportation of bulk goods and raw materials. The financial sector (FIRE, which is defined as Finance, Insurance and Real Estate) is the third highest impacted due to the banking and insurance requirements of navigation-dependent industries. Trade (wholesale and retail) and services (in particular, business services such as accounting) are only moderately impacted. As one would expect, the government sector sees a minor impact, primarily from those agencies associated with regulating or monitoring maritime transportation activity. Mining sees the smallest impact, partially because it is a rather small industry and because much of its transportation is local and not marine-dependent.

In addition to considering the total impact by industry, it is instructive to view the contribution of each maritime-dependent industry to the total. These results are displayed in Table 3 below. Given that some of these industries are rather small, results have been aggregated into logical summaries.

TABLE 3 CONTRIBUTION OF NAVIGATION-DEPENDENT INDUSTRIES TO THE TOTAL ECONOMIC IMPACT

Industry	Total Impact (GSP, $ Millions)	Direct Impact (GSP, $ Millions)	Indirect Impacts (GSP, $ Millions)
Commercial Fishing	555.5	348.7	206.8
Shipbuilding	948.6	561.3	387.3
Boatbuilding & Marinas	1835.0	1225.8	609.2
Passenger Transportation by Water	665.5	503.8	161.7
Freight Transportation by Water	1577.0	1056.3	520.7

The total impact of each industry has been broken into its direct and indirect impacts on the study area. When considering the indirect impacts, it is important to note that these are the impacts on the study area only. The ability to produce the input used by an industry must exist in the study area for it to be counted as an indirect impact. For example, shipbuilding requires a great deal of steel, which is not produced in great quantities in the study area. Consequently, the indirect impact of maritime-dependent industries in the study area is smaller than if the analysis were national in scope. Even so, maritime-dependent industries contribute a total impact roughly equivalent to half again their direct impact.

3.1 CONNECTICUT

The total economic impact of navigation-dependent industries in Connecticut is just over one percent of the state's $164.5 billion GSP. Compared to the other states in the study area, Connecticut sees a disproportionate navigation-dependent industry impact on manufacturing even though its estimated 2001 employment level is the lowest of the three states in the study area. This is due in large part to the production of submarines for the military in Groton. Without dredging, the ability to launch (and therefore build) submarines of the size currently in use would be eliminated.

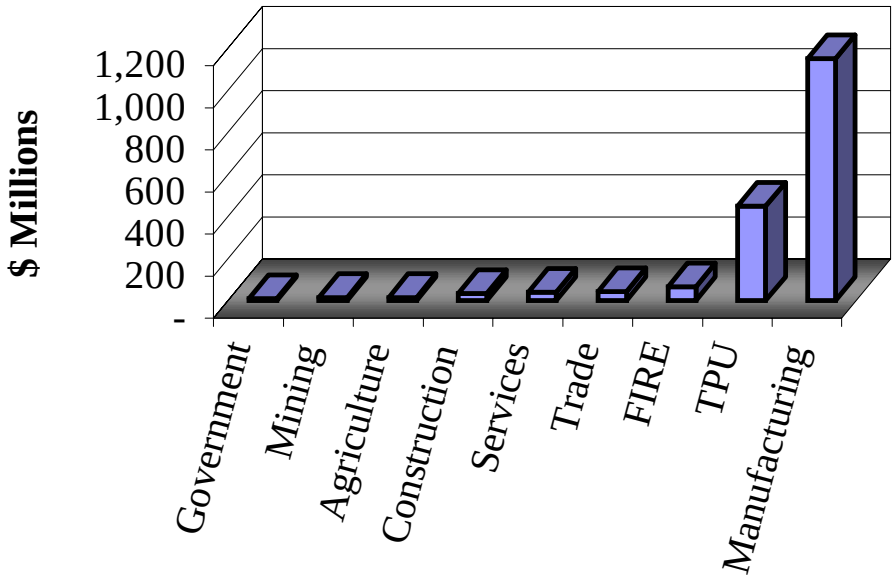
The transportation and public utility sector is the second most impacted industry as shown in Table 4. This is expected given the importance of Connecticut's seaports. Compared to other states, Connecticut sees a smaller share of the impact in services and finance. This is partially due to the sheer size of the manufacturing impact, but it is also a reflection that many of Connecticut's financial and service needs are met by New York.

TABLE 4 CONNECTICUT – DISTRIBUTION OF THE ECONOMIC IMPACT ACROSS INDUSTRIES

Industry (SIC Order)	Impact of Navigation-Dependent Industries on GSP ($ Millions)	Share of the Industry Impact (%)
Agriculture	15.4	0.8
Mining	14.0	0.8
Construction	32.9	1.8
Manufacturing	1,148.8	63.4
TPU	448.9	24.8
Trade	42.3	2.3
FIRE	64.3	3.5
Services	38.3	2.1
Government	7.9	0.4
TOTAL	**1812.8**	**100.0**

These effects are shown graphically in Figure 4, ranked by size of impact.

FIGURE 4 CONNECTICUT – IMPACT ON GSP BY INDUSTRY

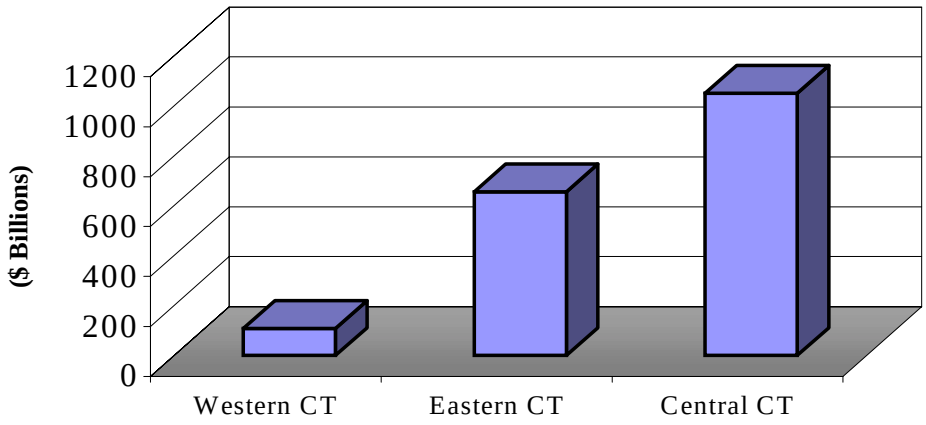


The impact of maritime-dependent industries varies between sections of Connecticut. To examine the differential impacts, the study area in Connecticut was broken into three subareas, Eastern (New London County), Central (Hartford, Middlesex and New Haven Counties) and Western (Fairfield County). Results for these areas are presented in Table 5 and graphically in Figure 5.

TABLE 5 CONTRIBUTION OF NAVIGATION-DEPENDENT INDUSTRIES TO GROSS STATE PRODUCT WITHIN CONNECTICUT

Region	2001 GSP ($ Millions)	Share (%)
Western	108.1	6.0
Eastern	655.2	36.1
Central	1,049.5	57.9
TOTAL	**1,812.8**	**100.0**

FIGURE 5 CONTRIBUTION OF NAVIGATION-DEPENDENT INDUSTRIES TO GROSS STATE PRODUCT BY SUB-AREA - CONNECTICUT



The distribution of the economic impact across industries at smaller geographies can be very different from that of the state. The following three tables (Tables 6, 7 and 8) display the impact by industry by portions of the state. Clearly, central and eastern Connecticut are more manufacturing-intensive than the western part of the state.

TABLE 6 CENTRAL CT – IMPACT ON GSP BY INDUSTRY

Industry	2001 Impact (GSP, $ Million)	Share of the Industry Impact (%)
Agriculture	0.91	0.1
Government	5.89	0.6
Construction	6.93	0.7
Mining	13.74	1.3
Services	28.45	2.7
Trade	31.22	3.0
FIRE	48.68	4.6
TPU	273.57	26.1
Manufacturing	640.11	61.0
TOTAL	**1049.54**	**100.0**

TABLE 7 EASTERN CT – IMPACT ON GSP BY INDUSTRY

Industry	2001 Impact (GSP, $Mil)	Share of the Industry Impact (%)
Mining	0.04	0.0
Government	1.96	0.3
Services	9.07	1.4
Trade	10.34	1.6
FIRE	14.09	2.1
Agriculture	14.44	2.2
Construction	25.83	3.9
TPU	96.89	14.8
Manufacturing	482.58	73.6
TOTAL	**655.24**	**100.0**

TABLE 8 WESTERN CT – IMPACT ON GSP BY INDUSTRY

Industry	2001 Impact (GSP, $Mil)	Share of the Industry Impact (%)
Agriculture	0.05	0.0
Government	0.09	0.1
Construction	0.18	0.2
Mining	0.21	0.2
Trade	0.69	0.6
Services	0.80	0.7
FIRE	1.49	1.4
Manufacturing	26.09	24.1
TPU	78.44	72.6
TOTAL	**108.05**	**100.0**

3.2 NEW YORK

The fraction of the $763.4 billion New York economy impacted by navigation-dependent industries is relatively small (0.3%) since the study area encompasses a smaller part of the state than is true for Connecticut. The impact of navigation-dependent industries on New York is concentrated in the transportation and public utilities sector. This is due to the scope of New York's freight waterfront operations in the study area as well as the importance that ferries play in local transportation in this area.

Manufacturing is the next most impacted sector, but it is below the average for the study area. It is certainly true that New York's role as a transportation hub soaks up much of the impact, lessening the relative importance of manufacturing. It is equally true that General Dynamics in Groton raises the

average for the study area. However, it is also the case that the high cost of commercial real estate and relatively high wages have combined to diminish the role of manufacturing in this area over recent years.

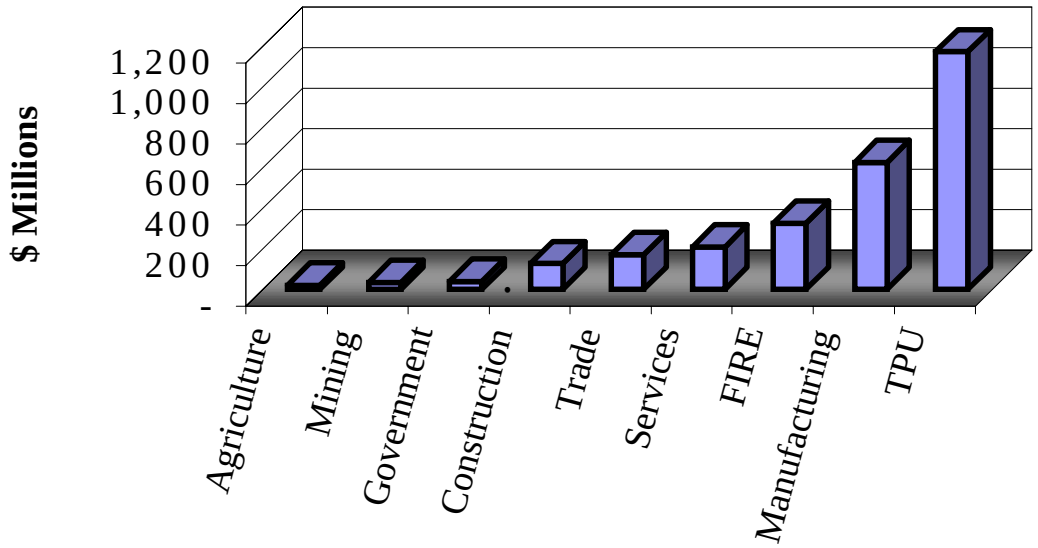
As one would expect from New York's role as a financial and business center, the impact of navigation-dependent industries on these sectors is above average.

TABLE 9 NEW YORK – DISTRIBUTION OF THE ECONOMIC IMPACT ACROSS INDUSTRIES

Industry (SIC Order)	Impact of Navigation-Dependent Industries on GSP for New York ($ Millions)	Share of the Industry Impact (%)
Agriculture	21.5	1.2
Mining	35.0	1.9
Construction	127.2	7.0
Manufacturing	625.6	34.5
TPU	1,172.5	64.7
Trade	171.0	9.4
FIRE	325.5	18.0
Services	209.1	11.5
Government	39.0	2.2
TOTAL	**2,726.3**	**100.0**

The impact on New York's GSP is shown in Figure 6 by industry.

FIGURE 6 NEW YORK – IMPACT ON GSP BY INDUSTRY



As with Connecticut, the impact of maritime-dependent industries varies across subareas of New York depending upon their industrial mix. To examine the differential impacts, the study area in New York was broken into four subareas, each defined by a county with the exception of Bronx and Queens, which were combined because of their similar natures. Total results for counties are presented in Table 10 and Figure 7, while the economic contributions of each industry by county are displayed in Tables 11 through 14.

TABLE 10 CONTRIBUTION OF NAVIGATION-DEPENDENT INDUSTRIES TO GSP WITHIN NEW YORK

County	2001 GSP ($ Millions)	Share (%)
Westchester	358.7	13.2
Nassau	422.2	15.5
Suffolk	459.8	16.9
Bronx/Queens	1481.8	54.4
TOTAL	**2,722.6**	**100.0**

The total economic contribution of maritime-dependent industries by county is displayed graphically below.

FIGURE 7 CONTRIBUTION OF NAVIGATION DEPENDENT INDUSTRIES TO GROSS STATE PRODUCT BY COUNTY – NEW YORK

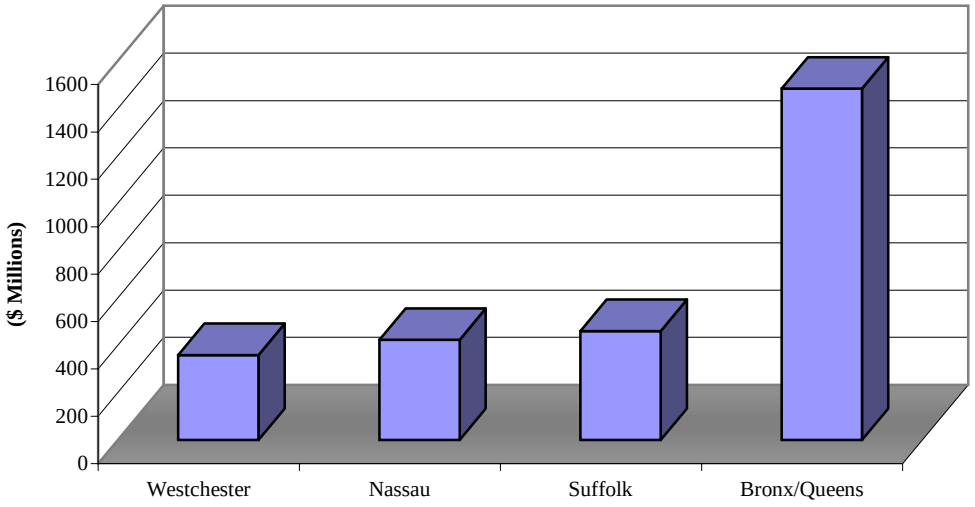


TABLE 11 BRONX/QUEENS COUNTY, NY – IMPACT ON GSP BY INDUSTRY

Industry	2001 Impact (GSP, $ Million)	Share of the Industry Impact (%)
Agriculture	3.17	0.2
Mining	19.02	1.3
Government	22.29	1.5
Construction	68.93	4.7
Trade	95.07	6.4
Services	116.92	7.9
FIRE	181.67	12.3
Manufacturing	327.71	22.1
TPU	647.04	43.7
TOTAL	**1481.82**	**100.0**

TABLE 12 NASSAU COUNTY, NY – IMPACT ON GSP BY INDUSTRY

Industry	2001 Impact (GSP, $ Million)	Share of the Industry Impact (%)
Mining	5.0	1.2
Government	5.6	1.3
Agriculture	5.9	1.4
Construction	20.7	4.9
Trade	25.4	6.0
Services	31.1	7.4
FIRE	48.3	11.4
Manufacturing	96.1	22.8
TPU	184.1	43.6
TOTAL	**422.2**	**100.0**

TABLE 13 SUFFOLK COUNTY, NY– IMPACT ON GSP BY INDUSTRY

Industry	2001 Impact (GSP, $ Million)	Share of the Industry Impact (%)
Mining	3.9	0.9
Agriculture	4.4	1.0
Government	5.6	1.2
Construction	18.6	4.0
Trade	25.1	5.5
Services	30.4	6.6
FIRE	48.0	10.4
Manufacturing	112.8	24.5
TPU	211.0	45.9
TOTAL	**459.8**	**100.0**

TABLE 14 WESTCHESTER COUNTY, NY – IMPACT ON GSP BY INDUSTRY

Industry	2000 Impact (GSP, $ Million)	Share of the Industry Impact (%)
Agriculture	4.3	1.2
Construction	19.0	5.3
FIRE	47.6	13.3
Government	5.6	1.6
Manufacturing	89.0	24.8
Mining	7.0	2.0
Services	30.6	8.5
TPU	130.4	36.3
Trade	25.3	7.1
TOTAL	**358.8**	**100.0**

3.3 RHODE ISLAND

With a GSP of $36.1 billion, Rhode Island is the smallest economy in the study area. As with the other states, the impact of navigation-dependent industries is felt primarily in the transportation and public utilities (TPU), finance and manufacturing sectors as shown in Table 15.

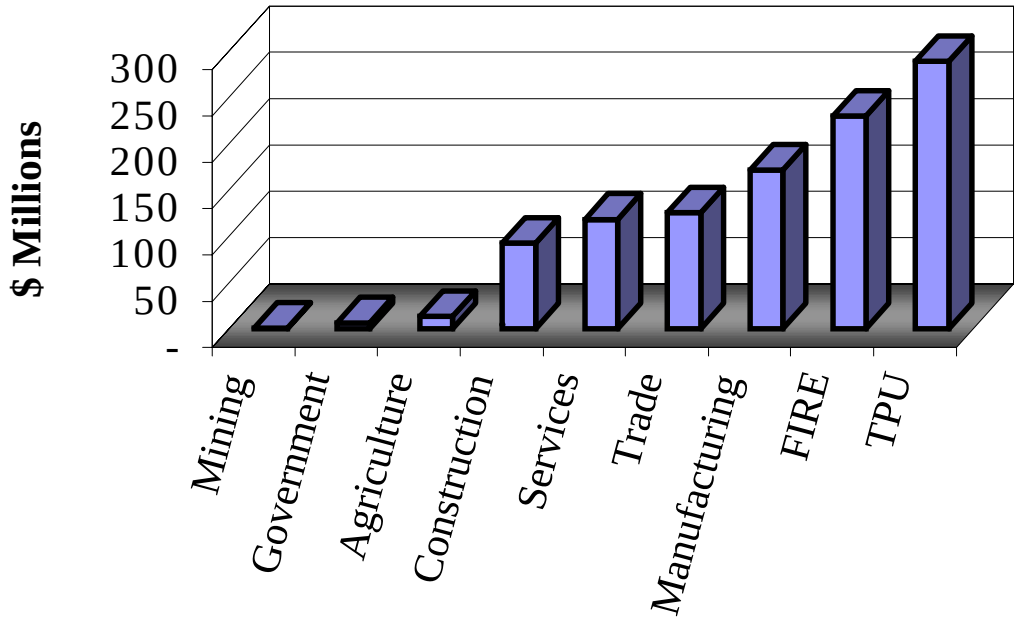
TABLE 15 RHODE ISLAND – IMPACT ON GSP BY INDUSTRY

Industry (SIC Order)	2000 Impact (GSP, $ Million)	Share of the Industry Impact (%)
Agriculture	13.0	1.2
Mining	0.24	0.1
Construction	92.2	8.8
Manufacturing	171.1	16.4
TPU	287.9	27.6
Trade	125.0	12.0
FIRE	229.1	21.9
Services	117.9	11.3
Government	6.1	0.6
TOTAL	**1042.5**	**100.0**

The only county of Rhode Island that falls within the study area is Washington County, including Block Island. The presence of the island gives this area a particular concentration in ferries and marinas leading to the majority of the impact falling on the transportation sector. Manufacturing is not a prominent feature in this part of the state allowing the financial sector to assume more relative importance.

The impact on each of Rhode Island's industries is shown in Figure 8 in millions of dollars.

FIGURE 8 RHODE ISLAND – IMPACT ON GSP BY INDUSTRY



3.4 RECREATIONAL BOATING

In addition to the inter-industry impacts on maritime dependent industries, the economic impact of recreational boating needs to be considered. While recreational boats on Long Island Sound number in the thousands, only a fraction of those have sufficient draft to be impacted by dredging. Boats dependent on dredging are typically not trailered to the Sound for each recreational visit, but rather are moored for the season.

The economic impact of recreational boating can be measured by calculating the number of boats moored, the number of visits to the boats and the amount of money spent per visit.

The number of moorings and transient berths in the study area can be ascertained from the Embassy Guide (Maptech, 7th Edition, 1998) which includes counts of slips and moorings for most facilities. The number of visits per boat is more difficult to quantify. However, peak boating season is known to run from late May through early November. Most boaters utilize their craft on weekends and holidays. Considering the number of weekend and holiday days in this time frame, a figure of 33 days of boating was approximated.

No survey of boaters was completed for this study, however, the US Army Corps of Engineers (USACE) published a study in 1996 (Estimating the Local Economic Impacts of Recreation at Corps of Engineers Projects) which estimated the spending of boaters and non-boaters at USACE project areas. This study concluded that boaters spent between $54.25 and $129.37 per visit, depending upon whether the boater

enjoyed a day trip or stayed overnight in the area. These figures are in 1996 dollars which would become $56.80 and $135.45 in 2001 dollars respectively, adjusted for inflation as measured by the CPI. The distribution of boaters by day versus overnight stay in the study area is not known, so a band width of the economic impact must be constructed using both figures.

The Corps' 1996 study also estimated the sales, income and employment impacts of recreational activity. While Long Island Sound was not represented in the 1996 study area, Philadelphia and Baltimore were. Their results were quite close to the mean impact, and so the average economic multipliers from that study are used in Table 16.

TABLE 16 ECONOMIC IMPACT OF RECREATIONAL BOATING IN STUDY AREA

Geography	Sales ($Thousands)	Income ($Thousands)	Employment
Eastern CT	3,092.8 - 7,375.4	1,620.9 - 3,865.3	83 - 199
Central CT	3,170.6 - 7,560.9	1,661.7 - 3,962.7	85 - 204
Western CT	1,708.2 - 4,073.6	895.3 - 2,134.9	46 - 110
TOTAL CONNECTICUT	7,971.6 – 19,009.9	4,177.9 – 9,962.9	214 - 513
Bronx/Queens, NY	827.7 - 1,973.7	433.8 - 1,034.4	22 – 53
Nassau, NY	628.5 - 1,498.8	329.4 – 785.5	17 – 40
Suffolk, NY	6,419.0 - 15,307.4	3,364.2 - 8,022.5	173 - 412
Westchester, NY	367.2 – 875.6	192.4 – 458.9	10 – 24
TOTAL NEW YORK	7,508.0 – 19,655.5	4,319.8 – 10,301.3	222 - 529
Block Island Sound	2,142.8 - 5,112.3	1,123.6 - 2,679.3	58 - 138
TOTAL RI	2,142.8 - 5,112.3	1,123.6 - 2,679.3	58 - 138
STUDY AREA TOTAL	**18,357.7 – 43,777.8**	**9,621.2 – 22,943.7**	**494 - 1179**

4.0 SUMMARY

The full impact of navigation-dependent industries is measured by the jobs and incomes that they support directly, as well as by the goods and services that depend upon them. In the absence of these critical industries, the economies in the study area would be significantly affected with the impact concentrated primarily in two industry groupings – transportation and manufacturing. Failure to maintain these industries would cost the area in excess of 52,000 jobs and more than $5.5 billion of GSP. Incomes would be reduced by over $6 billion which would, in turn, reduce tax receipts by some $850 million.

In addition, the consumer spending of recreational boaters who operate dredging-dependent pleasure craft must be added to the commercial impact. Such spending contributes between $18 and $44 million to the total sales of the study area economy and supports between 500 and 1200 jobs generating $10 to $22 million in personal income.

APPENDIX A

DRI-WEFA's U.S. REGIONAL MODELING METHODOLOGY

Appendix A
DRI-WEFA's
U.S. Regional Modeling Methodology

Overview

The U.S. Regional Economic Service of DRI-WEFA develops economic forecasts for nine regions, 50 states and the District of Columbia, 319 metropolitan areas, and 3,110 counties of the United States. Quarterly-frequency forecasts are produced four times a year for states and 114 major metropolitan areas using behavioral econometric models. Annual-frequency forecasts are prepared twice a year for the 205 smaller metro areas and counties using simulation-rule models.

DRI's regional models are dynamic econometric models of regional competition and growth. (*Regional* will refer to both region and state models in this methodology discussion.) The principal indicator of economic activity is employment, which is forecasted for 20 manufacturing industries and 11 nonmanufacturing sectors. Structural details of inter-industry purchasing relationships are integrated into the manufacturing sector of each model. Decisions of businesses to locate or expand in a region are driven by the competitive environment, represented by tax rates, the costs of labor and energy, and climate. Wage rates by industry, components of personal income, housing market activity, population, labor force, and unemployment rates are predicted within the models. This dynamic system captures the interactions between production, employment, incomes, industry costs, population, labor supply, and housing markets.

DRI-WEFA's regional models are linked to the DRI-WEFA Quarterly Model of the U.S. Economy, incorporating national demands for goods and services as drivers of economic activity within a region. The influence of the national economy is shaped by region-specific conditions of industry mix; relative cost structures, demographics, and income/expenditure patterns. A region's evolving competitive strengths and weaknesses determine its success in capturing a share of the national market.

DRI-WEFA's regional modeling system analyzes geographic areas of the United States in a two-stage procedure. The country is first divided into nine regions. The economies of the nine regions are represented in the Core regional model. Within this model, each region competes for a share of national economic activity; outcomes are determined by the region's existing set of industries and resources, its cost competitiveness, tax structure, climate and other locational factors. All nine regions are represented by behavioral equations; the results are constrained to sum to the national outlook by adjusting each region proportionately upward or downward.

In the second stage, nine separate models describe the dynamics of the states within each region. The New England model, for example, consists of behavioral equations for each

of the region's six states. The regional staff includes nine economists who are responsible for forecasts and analyses of a single region. The nine U.S. regions are New England, Middle Atlantic, South Atlantic, East South Central, West South Central, East North Central, West North Central, Pacific Northwest, and Pacific Southwest.

This approach has been adopted for theoretical and practical reasons. In business location decisions, the determining factors are different at the regional level and the state level. For example, when a firm is deciding whether to locate in New England or the South Atlantic, it will consider broad cost comparisons, proximity to markets climate, and the general quality of life. The choice between two states in a region is then influenced by specific factors such as tax and regulatory policy, labor force characteristics, wage rates, and other costs. Practically, this two-stage approach eases the model solution and forecast management process, efficiently using DRI-WEFA's experts on each of the nine regions.

Most equations in DRI-WEFA's region and state models are estimated by pooling time series of cross-sectional data, in order to identify the causal influences that vary over time and across regions. Generally, a double logarithmic functional form is used, and variables are specified as a share of national totals. Lag structures in economic relationships are varied to accurately capture the time pattern of dynamic responses.

Theoretical Foundations

DRI-WEFA's regional modeling approach is an extension of the export base (or economic base) theory, whereby a region's economic growth is enhanced by the sale of its goods and services to markets outside the region. By exporting, industries generate new jobs and income which, in turn, promotes the expansion of businesses that serve the local market, such as retail trade, utilities, services, and construction. As described in the accelerator/multiplier theory, business investment increases as the capital stock adjusts to changes in product demand. New job opportunities attract an in-migration of population, increasing demand for housing.

The ability of an economy to sustain higher growth is, however, constrained by competitive forces captured in DRI-WEFA's regional models. The entry of new workers into the labor force lags behind gains in employment, causing labor markets to tighten and putting upward pressure on wage rates. Higher operating costs for businesses and higher living costs for residents make the region less attractive, dampening economic growth.

This dynamic process represents a departure from the simple export base theory. The multiplier response to an initial stimulus or policy change is not constant, but rises initially with higher consumption and investment and then moderates as resource constraints and cost pressures impede further growth. Moreover, the response to an economic stimulus will vary across industries and states, depending on their technologies, cost structures, and inter-industry purchasing relationships. Part of the income created by

export sales will be spent on goods and services outside the state, diminishing the export multiplier.

Manufacturing Employment

The industrial structure of DRI-WEFA's regional models embodies several innovations in regional modeling, including inter-industry demands and industry-specific input cost indexes. In each of 20 manufacturing industries, a region's (or state's) share of national employment is determined by input costs, inter-industry generated demand, and an effective state and local business tax rate--all expressed relative to the nation's. In some industries, measures of local market demand are included. For example, real personal income affects employment in food processing, printing and publishing, and the stone, clay and glass industry. Home-building activity influences employment in the lumber and furniture industries.

Inter-industry demand variables capture a supplying industry's potential sales to other industries within the region. Purchasing relationships vary over time as technologies and industry structures change. Each region has clusters of interdependent firms in related industries. Some firms will sell their products outside the region, while supporting firms provide raw materials, components, and support services. These buyer-supplier relationships are captured within the model and provide insights into the full dynamic impact of tax policy changes.

Another important feature of DRI-WEFA's regional models is the explicit representation of industry costs. Each industry cost index incorporates manufacturing wage rates and total energy costs, which account for most of the inter-regional variations in business costs, along with materials costs and capital costs. The weights applied to these inputs vary over time with shifts in technology and production processes. Manufacturing and nonmanufacturing wage rates are determined by national wage rates and the area's relative labor market tightness, represented by the ratio of payroll employment to population. Thus, an increase in the employment ratio will put upward pressure on labor costs. Energy costs are determined in DRI-WEFA's energy model, while materials and capital costs are determined in the U.S. macro model. Regional models also includes business and non-business tax rates, represented by the ratio of state and local taxes to personal income.

Nonmanufacturing Employment

DRI-WEFA's regional models include behavioral equations for employment in 12 nonmanufacturing sectors: construction; finance and insurance; real estate; federal government; state and local government; mining; transportation, communication, and utilities; business services; health services; other services; retail trade; and wholesale trade. Each equation has a unique specification. Since many of these sectors serve primarily local markets, their employment growth depends on the strength of the region's economy. Key determinants of employment include the region's real personal income,

population, relative wage rates, and tax rates. In most equations, the independent and dependent variables are expressed relative to national levels.

Manufacturing activity (along with real personal income) directly affects employment in several supporting sectors--wholesale trade; transportation, communication, and utilities; finance and insurance; and real estate. Employment in retail trade and services is determined by real personal income, representing consumers' purchasing power, and relative labor costs. The population aged 65 and over also affects health-care services. The proportion of the state's population that is concentrated in metro areas influences business and "other" services. Employment in state and local government is determined by population and government revenues, which in turn depend on personal income growth.

In a deregulated environment, the locational decisions of financial services companies are increasingly sensitive to the competitive environment. Employment in finance and insurance is driven by population, real per capita income, and housing starts. Employment in real estate is determined by population, single-family housing starts, home sales, home prices, and the state and local tax burden.

Construction employment depends on housing starts and employment in all other sectors, capturing demand for nonresidential buildings. In several states, mining activity is concentrated in building materials and thus is affected by construction jobs. Mining employment is also determined by rotary rigs in operation, coal production, and ore production, which are exogenous variables.

Wages and Incomes

Personal income is defined as the sum of seven components less personal contributions for social insurance. The seven components are wages and salaries, other labor income, transfer payments, property income (dividends, interest, and rent), farm proprietors' income, nonfarm proprietors' income, and a residence adjustment. The residence adjustment is needed because wage and salary income is reported by place of work, while personal income is defined by place of residence. New Hampshire's residence adjustment is positive, while Massachusetts' is negative, reflecting the fact that a significant number of New Hampshire residents commute to jobs in Massachusetts.

Wages and salaries are the largest component of personal income. For both manufacturing and nonmanufacturing aggregates, wage and salary income is the product of employment times wage rates. Wage rates (annual wage and salary income per employee) are determined by national wage rates and the region's relative labor market tightness, represented by a ratio of payroll employment to population. In most nonwage income categories, a region's share of U.S. income is determined by its shares of population and wage income. Transfer payments are also affected by the proportion of residents aged 65 and over, reflecting the large role of Social Security and Medicare

payments. A region's share of farm income is driven by its share of cash receipts for crops and livestock, which are exogenous to the model.

Population and Labor Force

Population is endogenous in DRI-WEFA's regional models. It depends on national demographic trends and regional conditions: employment opportunities, state and local tax burdens, home prices, and climate, represented by heating-degree days. Employment growth drives population growth, as people tend to follow job opportunities. New England experienced a wave of in-migration during the boom of the 1980s, followed by out-migration during the 1989-92 recession. Texas had similar experiences during the energy price cycles of the 1970s and 1980s. Steady migration to South Atlantic states, in contrast, reflects the region's warm climate, low taxes, and low cost of living.

The labor force is estimated as a proportion of the population. A region's labor force participation rate follows national trends and is affected by its position in the employment cycle. The unemployment rate is determined from payroll employment and the labor force. This equation is not an identity, since payroll employment is measured on an establishment basis, excluding farm workers, the self-employed, and workers on strike. The labor force, unemployment rate, and household employment come from a survey of residents. A person holding two jobs would be counted once in the household survey, but twice in the payroll survey. A New Hampshire resident working in Massachusetts would be counted in New Hampshire's household employment survey and in Massachusetts' payroll employment survey.

Housing Market

DRI-WEFA forecasts single-family housing starts, multi-family housing starts, and mobile home shipments, along with actual and trend housing stocks for all three market segments. Total housing starts are determined in a stock-adjustment process. Market imbalance is measured by the gap between the desired and actual housing stocks. Thus, housing starts are the result of movement toward an equilibrium between the desired and actual housing stock.

Desired housing stocks were developed by estimating equations for the actual housing stock using as determinant the adult population and housing affordability. Solving these equations yields estimates of the desired, or trend, housing stock. Housing affordability--also a key determinant of housing starts--is a composite measure of mortgage payments, property taxes, utility costs, and depreciation relative to average household income.

The single-family share of total housing starts is determined by trends in the national housing mix, per capita personal incomes, and single-family market imbalances. Mobile home shipments follow the region's home-building cycle.

Gross State Product

A satellite econometric model predicts nominal and real gross state product for nine sectors of the economy: agriculture, forestry, and fisheries; construction; finance, insurance, and real estate; government; manufacturing; mining; transportation, communication, and utilities; services; and wholesale and retail trade. Gross state product is reported by the U.S. Commerce Department at an annual frequency for the years 1977 to 1998. Real gross state product is measured in 1996 chain-weighted dollars. In DRI-WEFA's gross state product model, the nation's real gross product by industry is first estimated from final demands predicted in the U.S. Model. In nonfarm sectors, each state's share of U.S. gross product depends on its share of industry employment. The agricultural sector's gross product is determined by inflation-adjusted crop and livestock sales. Price deflators for the nine sectors are estimated from corresponding national deflators for final demands or producer prices for specific commodity groups.

APPENDIX B

DRI-WEFA's INDUSTRIAL MODELING METHODOLOGY

Appendix B
DRI-WEFA's
Industrial Modeling Methodology

STANDARD INDUSTRY CLASSIFICATION (SIC)

SIC Overview

The Standard Industrial Classification (SIC) is the statistical classification standard underlying all establishment-based Federal economic statistics classified by industry. The SIC was developed for use in the classification of establishments by type of activity in which they are engaged for the purpose of facilitating the collection, tabulation presentation and analysis of data relating to businesses, and for promoting the comparability of establishment data describing various facets of the U.S. economy. The classification covers the entire field of economic activities and defines industries in accordance with the composition and structure of the economy.

The following principles guided the development and refinement of the SIC system:

- The classification should conform to the existing structure of American industry.
- Each establishment is to be classified according to its primary activity.
- To be recognized as an industry, the group of establishments constituting the proposed classification must be statistically significant in the number of persons employed, the volume of business conducted, and other measures of economic activity.

The structure of the classification system makes it possible to analyze data on a division, 2-digit major group, 3-digit industry group or a 4-digit industry code basis.

An establishment is an economic unit where business is conducted or where services or industrial operations are performed. It is generally a single physical location. Where distinct and separate economic activities are performed at a single physical location each activity should be treated as a separate establishment.

Each operating establishment is assigned an industry code on the basis of its primary activity, which is determined by the principal product or group of products produced or distributed, or services rendered.

In 1987, the SIC structure was updated. The primary changes focused on adjustments to accommodate technological changes, institutional changes such as deregulation of banking, communications and transportation, and the expansion in the services sector.


WEFA

WEFA

BUSINESS FORECASTS

Model Overview

DRI-WEFA's business demographic model contains a consistent set of statistical estimates and forecasts for key business characteristics over an 11 year horizon. These variables (number of business establishments, employees, and sales by 4-digit SIC code) are provided for a benchmark historical year, current-year, and five forecast years at several geographic levels, including national, state, metropolitan area, county and zipcode.

The models specifically forecast the variables at the county and ZIP Code level. The other geographic levels are created by aggregating these two modeled levels. All business demographic modeled databases are designed to meet two key criteria:

- They must reflect economic activity that is consistent with actual information available at these two levels of geography.
- They must also agree with published values for national and state employment, establishment and sales data.

The county and above forecasts are developed using current and historical data as well as economic modeling techniques. This approach enhances economic analysis in two important ways. First, it utilizes all current data and information to accurately estimate the current location of employment, establishments and sales. Second, it defines the relationships between each variable and the appropriate economic, cyclical, and migratory factors that cause their movements over time.

The model estimation process incorporates the effects of the business cycle on employment trends and yields more accurate forecasts at the county level and higher level geographies. The estimated relationships are used to develop estimates for the current year and forecasts for each of the next five years that reflect DRI-WEFA's widely used Regional, State and County Economic Forecasts.

DRI-WEFA's approach accurately depicts changes in worldwide, domestic, state, and local economic activity. In this context, the estimates and forecasts account for changes in global and local economic conditions and not merely trends embodied in past economic censuses and annually recorded economic data. Each area is modeled both individually and linked to its parent geography modeling system. This approach is referred to as a top-down/bottom-up model, and contrasts sharply with pure regional share (top-down) models and those not linked to national and regional models (bottom-up). DRI-WEFA's model contains the best of both approaches.

The state, MSA and country models are econometric in nature incorporating underlying behavioral relationships between such concepts as the business cycle, the timing and

amplitude of the turning points, and the disparities that exist across state, counties and local areas. These models are policy sensitive in that they respond to changes in tax rates, military spending, utility costs, and other external factors.

Model Sources

Detailed county level data for employment and establishments are available from a number of government sources. DRI-WEFA's business forecasts incorporate data from:

- County Business Patterns (CBP) - Data from 1980 to 1991 were used for establishing the starting estimate of establishments and employment.
- Bureau of Census - Augmented business estimates for the agriculture industry which is typically under-represented in most other sources.
- Bureau of Labor Statistics (BLS) - The basis for DRI-WEFA's U.S. Macro and regional modeling efforts, these statistics serve as constraints or controls on the county level forecasts. BLS data were also used to augment statistics for government establishments and employment.
- Business-Facts - Used as an "actual" observation for 2001 for distributing business changes within low level geographies.
- DRI-WEFA's United States Macro Forecasts - Used as benchmarks.
- DRI-WEFA's Regional United States Forecasts - Used as benchmarks.

State Forecasts - Employment and Establishments

The starting point for DRI-WEFA's regional forecasts is the Bureau of Labor Statistics (BLS) 790 series studies. The foundation for our county and ZIP Code forecasts involves the measurement of change in employment levels by industry. The BLS employment statistics for states and MSAs for 30 industry groups form the core of DRI-WEFA's regional forecasts. These 30 industry groups represent mostly 2-digit SICs for manufacturing and 1-digit SICs for all other industries. The information is updated quarterly as part of DRI-WEFA's Regional Forecasts.

DRI-WEFA forecasts state and MSA employment to the year 2005 using multivariate regression models comparing historical change at the 1- and 2-digit level to the economic factors that lead to employment creation. The DRI-WEFA Regional Model forecasts out for these years using the 30 SIC groups. The actual industries reported and the level of detail varies by state within the BLS database. Larger states have more detailed statistics than smaller states. These variations cause inconsistencies between the historical data. It is important to correct these problems and create a consistent set of employment figures for all 2-digit SICs at the county level. At an MSA level the information is available at the 1-

digit level only. DRI-WEFA uses the BLS state data as control totals for its modeling efforts.

To convert this information into the business demographic model, DRI-WEFA first standardizes the database to eliminate state level inconsistencies through the incorporation of additional sources, such as County Business Patterns (CBP), which provide consistent historical information for all 2-digit, 3-digit, and 4-digit SICs for all states and counties in the United States. This baseline information is then forecast out to future years using a regression model, based upon the relationships of the employment changes at the 1-digit level and the 2-digit level. The CBP data is used to allocate out the growth rates indicated in the BLS data initially down to the 2-digit SIC level. This same approach is then applied to allocate the 2-digit level data down to the 4-digit level using the CBP 4-digit level data.

To forecast employment at the 4-digit level, DRI-WEFA uses the 1980-1998 CBP trend lines to establish the initial relative growth rates. These initial forecasts are then adjusted to constrain the 4-digit employment to the 2-digit levels previously modeled**.** This creates the State Employment Base.

To forecast business establishments at the state level, DRI-WEFA creates a bivariate regression model comparing establishment to employee ratios for the years 1980-1997, using the CBP data. A separate model is created for each state for each SIC. These models are applied to the State Employment Base. The result is the State Establishment Base**.**

County Forecasts - Employment and Establishments

A county-level historical database for the period 1980-1998 was created to ensure internal consistency between MSA, state and national forecasts. DRI-WEFA first recalculated the national level government data so that data collected prior to 1987 were consistent with data collected after the 1987 SIC code changes. This provides the model with a database from which to infer trends and ensures that outlying data will not unduly influence the forecast outcome.

From this base, DRI-WEFA is able to estimate employment trends on an individual county basis. The trend established by this procedure is independent of any state or national level forecast. By combining this independent trend analysis with DRI-WEFA's state and metropolitan area forecast, DRI-WEFA is able to estimate a unique growth pattern for each of the nation's 3,141 counties. Due to the fact that the government data for MSAs are collected independently of the CBP data used for the first estimate of county employment, estimated employment differs from the MSA count by several percent. This bias is corrected by an iterative process to isolate the county level employment combination that satisfies the county, state and MSA level estimates.

DRI-WEFA uses bivariate regression models and ARIMA techniques to estimate county employment growth rates relative to state employment established in the state modeling procedure. In the first step, CBP is again used to allocate out the 4-digit SIC level state data to each county within the state. This process results in an estimate of the county employment growth rate relative to states and is conducted for each SIC.

The next step compares the aggregation of these initial county employment estimates to the state model results. Constraints are applied to individual county/industry growth rates. The constraints used minimize inconsistencies that rapidly changing counties over a five-year horizon could cause by dampening any county's SIC growth rate when the rate exceeds a reasonable threshold.

Once the constraints are applied, the constrained forecasts are adjusted to foot to the previously determined state forecasts using a ratio adjustment technique where the distribution of the constrained initial results are applied to the state forecasts to create a final county level employment forecast.

The historical relationship between establishments to employment is again modeled. The regression results are used to estimate establishment counts for all SICs within counties. These results are then benchmarked to the state forecasts using a similar ratio adjustment technique as described above for employment. DRI-WEFA performs reasonableness tests at the one-year, five-year, and ten-year growth rates to ensure consistency in the models.

The final step in creating business demographic county forecasts is applying DRI-WEFA's forecast growth rates to the current-year Business-Facts database, such that the Business-Facts data become the benchmark. The growth rates are applied going forward to create the final Business demographics county forecasts and backward to create a consistent benchmark year 1990. Due to changing methodologies in the creation of Business-Facts, it was determined that the Business-Facts file could not be used to determine rates of change for geographies.

Special Cases - Farming, Railroad and Government

Due to a lack of consistent data, these methodologies are not applied to the Farming, Railroad, and Government industries. To forecast employment and establishments for these special cases, unique models are created.

The Census of Agriculture county statistics are used to augment Business-Facts current and historical data. The Census of Agriculture provides data at the state and county level for Farming. The latest Census of Agriculture data available are from the 1992 study. DRI-WEFA's regional group forecasts Farming at the state level. Farming is also done at the 2-digit level. DRI-WEFA uses the two data points tied to the national monthly employment values for Farming employment and annual national establishment estimates.

The BLS studies have employment data nationally and at the state level for the railroad industry. To forecast Railroad data to county, DRI-WEFA uses employment in airlines and trucking as a surrogate for the presence of railroad businesses. Railroad is a 2-digit SIC.

The Bureau of Economic Analysis provides data for state and counties for Government. The government data are difficult to forecast since no one really knows how many government facilities exist. DRI-WEFA applies the growth rates across all government locations.

Sales Forecasts

The final step in completing this forecasting process was to estimate and forecast sales for all levels of geography and every industry. DRI-WEFA leveraged the national total output estimates derived from the industry demand table to achieve this objective. An output per employee factor for each industry was created using these total sales statistics and the BLS employment figures.

There is one exception. DRI-WEFA replaced the BEA total output data for Retail and Wholesale Trade with more detailed data from the Census Bureau's Census of Retail Trade and Census of Wholesale Trade.

The factors were multiplied by business demographic employment estimates to create an initial set of ZIP Code and county sales estimates for each industry. These forecasts were aggregated to national levels and compared to the DRI-WEFA national control totals. The factors for several industries were then adjusted to better foot to these national controls. These adjusted factors are then reapplied to business demographic employment forecasts to create a final estimate and forecast of sales for all industries at the ZIP Code and county level.

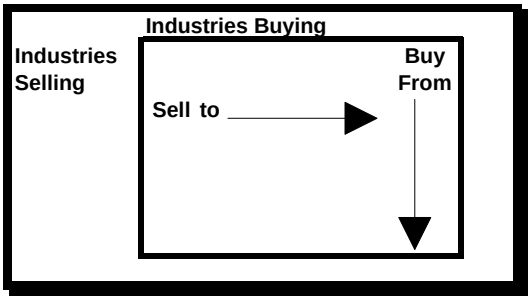
INDUSTRY DEMAND

Model Overview

One of the basic requirements of business demographics is a consistent set of historical and forecast industry transactions on the national level. These data are available from the Bureau of Economic Analysis (BEA) and released as the benchmark input–output accounts of the United States. Input-output is defined as the economic interchange between industries. The amount of value contributed by an industry into another industry's production process is captured as the input side of the equation. The amount of output generated by an industry to all other industries is captured by the output component. The industrial breakdown generally follows a standard 4-digit SIC detail for manufacturing and 3- or 2-digit SIC for the non-manufacturing sector.

The construction of an input–output table for an economy as large and complex as that of the United States is a very complex, time consuming activity. There have been only six national input–output tables of the United States constructed in the last 30 years [for the years 1967, 1972, 1977, 1982, 1987 and 1992].

The DRI-WEFA Group examined the 1982, 1987 and 1992 Input–Output Tables to reconcile major SIC differences between the three time periods. This comparison provided a guide in understanding the degree of structural shifts and data revisions between the benchmark years. Information about the movement of the transactions between 1982 and 1992 directed generation of the table beyond the 1992 benchmark year.



The input–output accounts provide a comprehensive set of data that records the deliveries of industrial outputs among industries and final users, as well as the purchases of inputs from industries and suppliers of primary factors. These accounts are commonly organized and presented in table format where each industry is recorded twice: shown once as a row indicating the distribution of output, and once as a column indicating the purchases of inputs.

In forecasting the demand forecast tables, it is necessary to employ a theoretically sound procedure to preserve the important properties of the Input–Output Tables. Therefore, an initial review of the standard method known as the RAS algorithm is in order.

The Theoretical Development of the Weighted RAS Method

Although there exists a variety of techniques for estimating the changes in input–output factors over time, the algorithm used in constructing business demographic Demand Forecast Databases is based upon the RAS method. The chief merits of this method are two:

1. requires minimal datasets
2. studies have found the accuracy of the RAS method to be superior to other non-survey coefficient adjustment techniques.

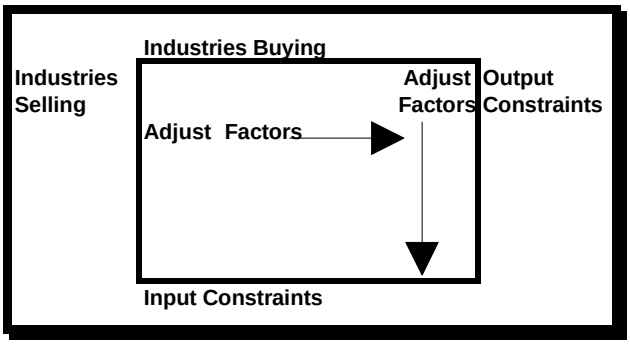
In its most rigorous and standard theoretical form, the RAS method requires three sets of data:

1. the direct factor matrix and an input–output table for an initial year
2. a set of values representing total output by sector for each subsequent year
3. values for intermediate inputs and intermediate outputs in each subsequent year.

Inputs represent the value of goods purchased for incorporation into an industrial process. Outputs represent the value of goods sold by an industry. Intermediate inputs or outputs represent transactions other than final transactions. For example, a steel manufacturing firm sells $1,000,000 of steel to a car manufacturer. The car manufacturer makes a car and sells it to a car dealer, who in turn sells it to a consumer. The steel represents an intermediate input to the production of the car.

Given these sets of data, an iterative adjustment procedure is then applied to the direct factor matrix. This yields an adjusted factor matrix for each subsequent year that is consistent with the intermediate input and outputs of that year. The factors are adjusted to predict the intermediate output, then readjusted to also fit the intermediate input values. This adjustment procedure continues in an iterative fashion until both input and output can be predicted.

The first step involves multiplying the total output values and the direct factor matrix to produce a set of intermediate output values. The second step involves the summing of direct input factors along each column of the matrix and comparing them to the ratio of intermediate inputs to total output in that column. These two properties serve as row and column constraints in the estimation procedures.



Row adjustments continue in the matrix; but as a result of these adjustments, it will no longer be generally true that the column constraints are still valid. Therefore, it is necessary for similar adjustments to be made along each of the columns of the matrix to ensure the sum of direct input factors along each column equals the ratio of intermediate inputs to total output in each respective column. This process must continue - first adjusting the rows and then the columns of the factor matrix - each time to bring the matrix more and more in balance with its two constraints.

Implementation In The Business Demographic Model

Two key data components are required to accurately develop industry transactional matrices. The first required database contains total output for all industries across the time horizon being measured. This information represents the total value of an industry's output or production and serves as control points for the modeling effort. In some industries it is represented as total sales, while in others it is valued as the net value-added by the industry. The second database contains the cross-industry transaction relationships for all industries over the same time horizon. This information helps explain each industry's sales relationship and purchasing relationship to all other industries.

The primary source for the total output database is DRI-WEFA's Quarterly Industry Forecasts. DRI-WEFA forecasts total output for 117 key sectors of the economy every quarter as part of their broad econometric forecasting business.

The primary source for the transaction matrices is the BEA Input/Output Matrix of transactional activities from 1992. The data are available for 500 plus sectors representing key aggregations of industries. Most manufacturing industries are represented at the 4-digit

SIC level. Most of the other industries are represented at the 2- and 3-digit level. Government is available only at the aggregate government level. The BEA I/O matrix is released after a seven year time lag with the 1992 table becoming available in 1999. The BEA utilizes information from the 1992 Economic Census, enhancing it by adding the data for the financial, insurance, and real estate industry division. The Economic Census is performed by the Census Bureau every five years. Each industry sector included in this collection of data has a different data source.

Developing Final Demand Factors

The first step is to create a valid econometric-based set of industry forecasts for output. Total industry output is forecast by DRI-WEFA's Industry Model for 117 Industry Sectors. This model forecasts each year out to the year 2005.

The next step is to allocate these forecasts down to the 450 plus sectors contained in the BEA Input/Output Tables to create a consistent set of industry definitions. This is done using County Business Patterns historical employment trend data. The 117 DRI-WEFA sectors are disaggregated into the 450 plus I/O Sectors using the I/O sectors share of employment of the DRI-WEFA sectors.

DRI-WEFA then collapses certain sectors into aggregate sectors where total output information for those sectors is limited. These sectors include agriculture, services and construction. This collapse of sectors results in a final table of total output per year for the forecast years for 440 sectors. These forecasts serve as the total output control benchmark for the next step of the model.

Developing The Matrix Coefficients

The 1992 BEA Input/Output Matrix of industry transactions is the latest data available. DRI-WEFA applies the 1992 matrix to each year's total output forecast to initially estimate the value of inter-industry exchange for each year. The I/O matrix represents a set of coefficients for each buying and selling industry sector. The coefficients represent the percentage of dollars spent by an industry relative to the total dollars output from that industry. Multiplying the coefficient by the total dollars output results in the total dollars spent for purchases in that sector.

The next step attempts to rationalize the coefficients in the context of each year's total output forecast. This rationalization is done using a modified RAS methodology, where DRI-WEFA first adjusts row coefficients to foot to the row totals, then the column coefficients until they foot to the column control totals. This procedure is repeated until the row and column adjustments balance. The RAS modeling iterations are performed independently for each year being forecast.

As a check to this process, the I/O coefficient trends are analyzed for the 1982, 1987 and 1992 BEA I/O matrices. Using these two data points, each coefficient is forecast out for each year being evaluated. These alternate sets of coefficients are compared to the RAS results for each year. If this trend analysis comparison is consistent, DRI-WEFA accepts the RAS results. If the results do not compare, the RAS process is continued until consistency between these two methodologies is achieved. The result of this process is a new set of coefficients for each year.

Converting Sectors To SICs

The next step is to allocate out this sector-based matrix into the final 4-digit SIC-based matrix which will be integrated into the business demographic model. This is accomplished by allocating from sector to SIC using employment distributions of each SIC within its sector. This procedure involves several steps.

First, the sector matrix of total dollars transacted between sectors is converted to a dollars per employee factor using BLS-derived employment statistics. These factors are then allocated across all columns using the Business demographics-based employment forecasts, where the employment in each SIC is multiplied by its sector dollars per employee factor.

To allocate out to all rows, the total dollars transacted are distributed using each SIC's share of employment within its sector. This approach is used for all SICs except one.

SIC 9999 - miscellaneous businesses - is a special case in that it is not represented in the BEA I/O tables and needs to be handled under a separate procedure. DRI-WEFA has total output for this industry. DRI-WEFA distributed the total output across all industries using each industry's share of total U.S. employment. The result of these procedures is a consistent set of inter-industry transaction matrices built predominantly at the 4-digit SIC level for each year of business demographics forecasts.

WEFA

APPENDIX

Measures of Output or Sales

The Industry Demand database provides estimates of each industry's output as consumed by every other industry. The database provides dollar estimates for the inter-industry exchange that occurs in the economy. In the business demographic model, we have attempted to capture the final demand for all goods and services consumed by industry. It is important for the user to understand the definition of the value represented in each industry's demand to assure accurate analysis and interpretation. This section will present the output components captured in the business demographic Industry Demand database.

In the database's original form industries are categorized into sectors. A sector is an aggregation of similar industries. In general, the output estimates measure the production of a sector; that is, the value of all goods and services produced. In most cases, this value is closely aligned with a sector's sales. In some cases it represents the value-added by the sector to its commodity purchases of items used into the production process. An example of this concept would be a steel manufacturer that sells steel to an automotive parts manufacturer who builds a fender, then sells the fender to GM for inclusion in a new car. GM sells the car to a new car dealer who in turn sells it to a consumer. The value of the steel is measured in the steel manufacturer's SIC (3325). The value-added of turning the steel into a fender is measured in the parts manufacture's SIC (3465). The value-added of including the fender to the car is measured in the automotive manufacturer's industry (3711). The car distributor (SIC 5511) only measures the value-added of the distribution system, not the value of the car. This process attempts to eliminate double counting of the value of a component in the final demand tables.

The values represented in business demographic forecasts are consistent with these definitions with one exception. We have factored the total output for the Retail and Wholesale Trade groups up to reflect total sales instead of just the value-added of these distribution channels. The effect of this factoring is to have the total output more closely reflect sales than just the marginal output of these non-manufacturing industries.

The following tables document the components measured in estimating the final output for each industry. The data are organized into Industry Divisions and sector. The number in parantheses represents the government's sector number(s). This information was extracted from the document "Benchmark Input-Output Accounts of the United States 1992," published by the U.S. Department of Commerce.

WEFA

Agriculture, Forestry & Fishing

Livestock And Livestock Products (1)

Cash marketings of products
Inventory accumulation
Farm-home consumption
Produced and consumed feed
Manure
Recreational services
Custom work
Custom feeding fees
Interfarm, intrastate shipments of livestock
Animal work power

Other Agricultural Products (2)

Cash marketings of products
Inventory accumulation
Farm-home consumption
Produced and consumed feed and seed
Recreational services
Custom work
Farm product warehousing and storage for CCC
Forest products (including stumpage, Christmas trees, saw logs, and firewood)
Greenhouse and nursery products

Forestry And Fishery Products (3)

Purchases of stumpage, less government production
Christmas trees
Game preserve products
Forest nursery products
Forest products
Fishery landings

Agricultural, Forestry, And Fishery Services (4)

Poultry hatcheries
Agricultural services
Forestry services
Fish hatcheries
Landscape and horticultural services
Employee tips
Landscape services
Farm product preparation services

Grooming and boarding of pets at pet shops

Excludes:

Cost of resales
Custom slaughter of meat animals
Margin on sales of nursery plants

Mining

Metallic Ores Mining (5+6)

Industry shipments, including miscellaneous receipts
Change in inventories of mined or quarried products
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries

Excludes:

Cost of resales
Solid mineral exploration
New access structures
Margin on resales

Coal Mining (7)

Industry shipments. including miscellaneous receipts
Change in inventories of mined or quarried products
R&D at auxiliaries

Excludes:

Cost of resales
Solid mineral exploration
New access structures
Margin on resales

Crude Petroleum And Natural Gas (8)

Industry shipments, including miscellaneous receipts
Change in inventories of mined or quarried products
R&D at auxiliaries

Excludes:

Cost of resales
Residue gas shipments included in SIC 1321 commodity shipments
Oil and gas well drilling
Oil and gas well exploration
Margin on resales

Nonmetallic Minerals Mining (9+10)

Industry shipments, including miscellaneous receipts
Change in inventories of mined or quarried products
Estimate of undercoverage of source data, including nonemployers

Excludes:

Cost of resales
Solid mineral exploration
New access structures
Margin on resales

Construction

Construction (11+12)

Contract construction receipts
Force-account construction activity
Revenues of land subdividers and developers
Construction activities excluded from mining industries
Engineering and architectural services included in value of construction
Estimate of undercoverage of source data
Construction work by wholesalers
Construction and installation work by retailers
Repair of central air-conditioning equipment

Excludes:

Cost of resales
Double counting of subcontractors
Landscape services
Millwork
Paving mixtures
Concrete products and ready-mix concrete
Fabricated structural metal and sheet metal work
Commercial lighting fixtures
Trucking receipts of construction establishments
Other telephone equipment installation charges
Margin on resales
Property management receipts of construction establishments
Engineering and architectural services of construction establishments
Repair services of construction establishments
Equipment rental receipts

Manufacturing

Food And Kindred Products (14)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates
Manufacturers' excise taxes
Custom slaughter of meat animals
Food processing by wholesalers
Bakery products baked by retail establishments

Excludes:

Cost of resales
Margin on resales

Tobacco Products (15)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Manufacturers' excise taxes
Tobacco stemming and redrying at wholesalers

Excludes:

Cost of resales
Margin on resales

Broad And Narrow Fabrics, Yarn And Thread Mills (16)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates
Commission finishing by wholesalers

Excludes:

Cost of resales
Margin on resales

Miscellaneous Textile Goods And Floor Coverings (17)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Apparel (18)

Industry shipments. including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates
Furs dressed by wholesalers
Custom made garments

Excludes:

Cost of resales
Margin on resales

Miscellaneous Fabricated Textile Products (19)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Lumber And Wood Products (20+21)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Millwork

Excludes:

Cost of resales
Margin on resales

Furniture And Fixtures (22+23)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Paper And Allied Products, Except Containers (24)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Paperboard Containers And Boxes (25)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Newspapers And Periodicals (26A)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Other Printing And Publishing (26B)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates
Printing work by wholesalers

Excludes:

Cost of resales
Margin on resales

Industrial And Other Chemicals (27A)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Agricultural Fertilizers And Chemicals (27B)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Plastics And Synthetic Materials (28)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Drugs (29A)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Cleaning And Toilet Preparations (29B)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Paints And Allied Products (30)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Petroleum Refining And Related Products (31)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes
Paving mixtures

Excludes:

Cost of resales
Margin on resales

Rubber And Miscellaneous Plastics Products (32)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Footwear, Leather, And Leather Products (33+34)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Glass And Glass Products (35)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Stone And Clay Products (36)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Concrete products and ready-mix concrete

Excludes:

Cost of resales
Margin on resales

Primary Iron And Steel Manufacturing (37)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Primary Nonferrous Metals Manufacturing (38)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Metal Containers (39)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Heating, Plumbing, And Fabricated Structural Metal Products (40)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Fabricated structural metal and sheet metal work

Excludes:

Cost of resales
Margin on resales

Screw Machine Products And Stampings (41)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales

Margin on resales

Ordnance And Accessories (13)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Other Fabricated Metal Products (42)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Jewelry engraving

Excludes:

Cost of resales
Margin on resales

Engines And Turbines (43)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Farm, Construction, And Mining Machinery (44+45)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Materials Handling Machinery And Equipment (46)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Metalworking Machinery And Equipment (47)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Special Industry Machinery And Equipment (48)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

General Industrial Machinery And Equipment (49)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Miscellaneous Machinery, Except Electrical (50)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Machine shop work

Excludes:

Cost of resales
Margin on resales

Computer And Office Equipment (51)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Service Industry Machinery (52)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Electrical Industrial Equipment And Apparatus (53)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Household Appliances (54)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Electric Lighting And Wiring Equipment (55)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Commercial lighting fixtures

Excludes:

Cost of resales
Margin on resales

Audio, Video, And Communication Equipment (56)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Electronic Components And Accessories (57)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Miscellaneous Electrical Machinery And Supplies (58)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes
Custom built parts

Excludes:

Cost of resales
Margin on resales

Motor Vehicles (Passenger Cars And Trucks) (59A)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Truck And Bus Bodies, Trailers, And Motor Vehicles Parts (59B)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes
Custom built parts

Excludes:

Cost of resales
Margin on resales

Aircraft And Parts (60)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods

Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Other Transportation Equipment (61)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Railroad equipment manufactured for own use by railroads
Boat repair at marinas
Boat repair at boat dealers

Excludes:

Cost of resales
Margin on resales

Scientific And Controlling Instruments (62)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates
Manufacturers' excise taxes

Excludes:

Cost of resales
Margin on resales

Ophthalmic And Photographic Equipment (63)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
R&D at auxiliaries
Services provided to foreign affiliates

Excludes:

Cost of resales
Margin on resales

Miscellaneous Manufacturing (64)

Industry shipments, including miscellaneous receipts
Change in inventories of work-in-process and finished goods
Estimate of undercoverage of source data, including nonemployers
Services provided to foreign affiliates
Manufacturers' excise taxes
Lapidary work
Cutting and setting stones to order

Excludes:

Cost of resales
Margin on resales

Transportation, Communications, & Utilities

Railroads And Related Services; Passenger Ground Transportation (65A)

Operating and other revenues of Class I, II, and III railroads
Operating and other revenues of switching and terminal companies
Estimate of undercoverage of source data
Employee tips
Scrap revenues
AMTRAK operating and dining car revenues
Freight car rental revenues
Operating revenues of private local and suburban transit companies
Sightseeing and other revenues of local bus companies
Charter bus revenues
Intercity bus revenues
School bus revenues
Taxicab revenues
Bus terminal and service facilities revenues

Excludes:

Rental receipts

Motor Freight Transportation And Warehousing (65B)

Motor freight transportation revenues
Warehousing revenues
Trucking terminal revenues
Stockyard revenues
Employee tips
Trucking receipts of construction firms
Warehousing revenues of wholesalers
Delivery charges of retailers
Storage charges of retailers

Excludes:

Rental receipts

Water Transportation (65C)

Water transportation revenues
Estimate of undercoverage of source data
Marine cargo handling revenues
Revenues of marinas
Docking services at boat dealers
Cleaning and maintenance of boats by boat dealers

Excludes:

Cost of resales
Boat repair at marinas
Rental receipts

Air Transportation (65D)

Domestic and international passenger and freight air transportation revenues
Federal taxes on air fares, air freight, and air facilities
Employee tips
Revenues of airports, flying fields, and miscellaneous services
Estimate of undercoverage of source data
Repair receipts
Aircraft storage receipts

Excludes:

Rental receipts

Pipelines, Freight Forwarders, And Related Services (65E)

Petroleum pipeline revenues (regulated and nonregulated)
Arrangement of freight transportation revenues
Arrangement of passenger transportation revenues
Packing, crating, inspection, and weighing services revenues
Miscellaneous transportation services revenues

Excludes:

Cost of resales (transportation services purchased by freight arrangers)
Rental receipts

Communications, Except Radio And TV (66)

Independent telephone services revenues
Local exchange telephone revenues
AT&T telephone services revenues
Radiotelephone revenues
Non-AT&T long distance revenues

Telephone equipment rental
Adjustment for uncollectible revenues
Federal excise taxes on telephone services
State & local excise taxes on telephone services
Estimate of undercoverage of source data
Overseas facilities adjustment
Telephone and telegraph equipment installation
Cable TV equipment installation
Telegraph services revenues
Cable and other pay TV revenues
COMSAT services revenues
Other communications services revenues
Other telephone equipment installation charges

Excludes:

Cost of resales
Margin on resales
Rental receipts
Telephone directory advertising revenues

Radio And TV Broadcasting (67)

Commercial radio and TV revenues
Public radio and TV expenses

Excludes:

Commission revenues of commercial radio and TV

Electric Services (Utilities) (68A)

Private electric services revenues

Excludes:

Cost of resales
Rental receipts
Royalty receipts

Gas Production And Distribution (Utilities) (68B)

Private gas services revenues
Revenues from transportation of gas

Excludes:

Revenues from imported gas
Rental receipts
Royalty receipts

Water And Sanitary Services (68C)

Private water supply services revenues

Private sewerage system revenues
Payments for refuse collection
Other sanitary services revenues
Steam and air-conditioning supply revenues
Irrigation system revenues

Excludes:

Trash and garbage hauling

Wholesale Trade

Wholesale Trade (69A)

Receipts of merchant wholesalers and agents and brokers on own-account
Expenses of manufacturers' sales branches and offices
Commissions of agents and brokers
Sales taxes collected by wholesalers
Excise taxes levied on wholesalers
Estimate of undercoverage of source data
Customs duties on imports
Services provided to foreign affiliates
Margin on resales occurring in manufacturing. mining, and service industries

Excludes:

Cost of resales for merchant wholesalers and agents and brokers on own-account
Service contracts
Government enterprise liquor stores
Farm product preparation services
Food processed by wholesalers
Tobacco stemming and redrying by wholesalers
Commission finishing by wholesalers
Furs dressed by wholesalers
Millwork
Printing work by wholesalers
Machine shop job work
Custom built parts
Lapidary work
Warehousing revenues of wholesalers
Repair receipts
Services provided by wholesalers
Computer services performed by wholesalers
Services
Equipment rental receipts
Rental and services provided by trade establishments

Retail Trade

Retail Trade (69B)

Receipts of retailers
Estimate of undercoverage of source data
Services provided to foreign affiliates
Sales taxes collected by retailers
Excise taxes levied on retailers
Margin on resales and vending machine sales by nonretail establishments

Excludes:

Cost of resales
Service contracts
Grooming and boarding of pets at pet shops
Landscape services
Construction and installation receipts
Bakery products baked by retail establishments
Custom made garments
Jewelry engraving
Boat repair at boat dealers
Cutting and setting stones to order
Delivery charges of retailers
Storage charges of retailers
Cleaning and maintenance of boats at boat dealers
Docking services at boat dealers
Repair receipts
Aircraft storage receipts
Commissions for arrangement of auto financing
Commissions for sale of life insurance
Services provided by retailers
Computer repair services performed by retailers
Services
Equipment rental receipts
Photofinishing in retail establishments
Meal and beverage receipts of retail establishments
Rental and services provided by trade establishments
Rental receipts at retail establishments
Coin-operated amusement devices at retailers
Sports instruction and rental of sports equipment
Medical services of optometrists
Boat operation, flight, music, camera, and sewing instruction

Eating And Drinking Places (74)

Receipts of taxable establishments
Taxes on services
Employee tips
Estimate of undercoverage of source data
Services provided to foreign affiliates
Meal and beverage receipts of retail establishments
Meal and beverage receipts of hotels and lodging places
Meal and beverage receipts of amusements
Meal and beverage receipts of schools
Meal and beverage receipts of associations

Excludes:

Cost of resales
Margin on resales

Finance, Insurance and Real Estate

Finance (70A)

Monetary income of Federal Reserve banks
Reimbursements by the U.S. Treasury to Federal Reserve banks
Imputed service charges of Federal Reserve banks
Monetary income of federal home loan banks
Noninterest income of commercial banks, savings and loans, and credit unions
Nondeposit trust company income
Functions related to banking revenues
Noninterest income of Federal and federally sponsored credit agencies
Noninterest income of personal credit institutions
Credit card fees
Merchant discounts on credit card transactions
Noninterest income of agricultural credit agencies
Monetary income of mortgage companies
Monetary income of mortgage loan brokers
Imputed service charges of investment companies
Underwriting revenues
Securities commissions
Trading gains (excluding capital gains and interest income)
Fees for investment advisory services
Income from sale of investment company shares
Other revenues of broker-dealers
Commodity revenues
Revenues of self-regulatory organizations
Revenues from services allied with the exchange of securities
Estimate of undercoverage of source data

Commissions for arrangement of auto financing

Excludes:

Interest and capital gains on trading accounts
Interest on repurchase agreements
Royalty income of agricultural credit agencies
Computer processing receipts of self-regulatory organizations

Insurance (70B)

Operating espenses of legal reserve life insurance companies, including profits, for life insurance activity
Expenses of foreign life insurance companies operating in the U.S.
Expenses of private pension funds
Life insurance premiums of fraternal benefit societies and mutual savings banks
Nonlife insurance premiums paid
Administrative expenses of self-insured and pre-paid health plans
Administration costs of Medicare and Medicaid programs
Income of insurance agents and brokers
Estimate of undercoverage of source data
Commissions for sale of life insurance

Excludes:

Life insurance claims and dividends paid by fraternal benefit societies and mutual savings banks
Nonlife insurance claims paid
Expenses of foreign branches of U.S. companies
Expenses related to real estate investment

Owner-Occupied Dwellings (71A)

Rental value of owner-occupied dwellings and mobile homes
Rental value of farm dwellings provided to farm laborers

Real Estate And Royalties (71B)

Revenues of real estate agents, operators, lessors, and managers
Rental value of buildings owned and used by nonprofits serving individuals
Royalty receipts
Depletion claimed by tax-exempt farmers' co-ops
Estimate of undercoverage of source data
Property management performed by construction establishments
Rental receipts
Royalty receipts
Rental fees from concessionaires

Excludes:

Oil bonus payments for oil rights

Revenues of land subdividers and developers

Services

Hotels And Lodging Places (72A)

Receipts of taxable establishments
Expenses of tax-exempt establishments
Taxes on services
Employee tips
Estimate of undercoverage of source data
Services provided to foreign affiliates
Lodging provided to employees
Room rentals
Private school room charges

Excludes:

Cost of resales
Margin on resales
Meal and beverage receipts of hotels and lodging places
Gambling and casino receipts of hotels

Personal And Repair Services (Except Auto) (72B)

Receipts of taxable establishments
Taxes on services
Employee tips
Estimate of undercoverage of source data
Services provided by wholesalers
Services provided by retailers

Excludes:

Cost of resales
Cash advances made by funeral parlors
Repair of central air-conditioning equipment
Margin on resales

Computer And Data Processing Services (73A)

Receipts of taxable establishments
Taxes on services
Estimate of undercoverage of source data
Services provided to foreign affiliates
Computer services performed by wholesalers
Computer repair services performed by retailers
Computer processing receipts of self-regulatory organizations
Computer services

Excludes:

Finance leasing

Legal, Engineering, Accounting, And Related Services (73B)

Receipts of taxable establishments
Expenses of tax-exempt establishments
Taxes on services
Estimate of undercoverage of source data
Services provided to foreign affiliates
Engineering and architectural services of construction establishments
Engineering and design services

Other Business And Professional Services, Except Medical (73C)

Receipts of taxable establishments
Expenses of tax-exempt establishments
Taxes on services
Estimate of undercoverage of source data
Services provided to foreign affiliates
Repair services
Equipment rental receipts
Photofinishing in retail establishments
Interior decorating services in retail establishments
Public relations receipts

Excludes:

Cost of resales
Margin on resales
Trading stamp redemptions
Computer services
Engineering and design services

Advertising (73D)

Receipts of taxable establishments
Taxes on services
Estimate of undercoverage of source data
Services provided to foreign affiliates
Telephone directory advertising revenues

Excludes:

Public relations receipts

Automotive Repair And Services (75)

Receipts of taxable establishments
Taxes on services

Employee tips
Estimate of undercoverage of source data
Services provided to foreign affiliates
Rental and services provided by trade establishments

Excludes:

Cost of resales
Margin on resales

Amusements (76)

Receipts of taxable establishments
Expenses of tax-exempt establishments
Taxes on services
Employee tips
State and local government pari-mutuel tax
Estimate of undercoverage of source data
Services provided to foreign affiliates
Rental receipts at retail establishments
Coin-operated amusement devices at retailers
Sports instruction and rental of sports equipment
Gambling and casino receipts of hotels

Excludes:

Cost of resales
Margin on resales
Rental fees from concessionaires
Room rentals
Rental of equipment
Meal and beverage receipts

Health Services (77A)

Receipts of taxable establishments
Expenses of tax-exempt establishments
Taxes on services
Estimate of undercoverage of source data
Services provided to foreign affiliates
Veterinary services
Medical services of optometrists

Excludes:

Double counting of receipts in hospitals and doctors' offices
Equipment rental receipts

Educational And Social Services, And Membership Organizations (77B)

In-kind compensation of educational establishments

Receipts of taxable establishments
Expenses of tax-exempt establishments
Taxes on services
Estimate of undercoverage of source data
Services provided to foreign affiliates
Boat operation, flight, music, camera, and sewing instruction

Excludes:

Cost of resales
Hospital expenses included in operating expenses of universities
Scholarships included in operating expenses
Capital expenditures included in expenses
Margin on resales
Margin on resales and vending machine sales
Rental receipts
Private school room charges
Meal and beverage receipts of schools
Meal and beverage receipts of associations

Public Administration

Federal Government Enterprises (78)

Postal Service revenues
Federal Government electric utility revenues
Federal nonappropriated-fund activity revenues and employee tips
VA canteen service fund revenues
GPO revenues
Federal crop insurance fund revenues less claims paid
National flood insurance revenues less claims paid
OPIC revenues less claims paid
FHA revenues less claims paid

Excludes:

Cost of resales
Cost of electricity purchased and resold
Rental receipts of electric utilities

State And Local Government Enterprises (79)

Alaska Railroad revenues
State and local government passenger transit revenues, including Long Island Railroad revenues
State and local government electric utility revenues
South Dakota Cement Plant revenues
Alaska Ferry revenues

State and local government waterport revenues
State and local government airport revenues
Highway toll revenues
State and local government gas utility revenues
State and local government water utility revenues
State and local government sewerage revenues
State and local government liquor store revenues
North Dakota Bank revenues
City market revenues
Public housing revenues
Municipal parking facility revenues
State and local government lottery revenues
Off-track betting revenues

Excludes:

Cost of resales
Operating subsidies
Cost of electricity purchased and resold